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AGRICULTURAL RESEARCH SERVICE  
WASHINGTON, D.C.

and

MICHIGAN AGRICULTURAL EXPERIMENT STATION  
EAST LANSING, MICHIGAN

and

BEET SUGAR DEVELOPMENT FOUNDATION  
DENVER, COLORADO

NOTICE OF RELEASE OF SR98 SUGARBEET GERMPLASM WITH HIGH LEVELS OF  
RESISTANCE TO RHIZOCTONIA DAMPING-OFF, CROWN AND ROOT ROT, AND FUSARIUM

The Agricultural Research Service of the U.S. Department of Agriculture, Michigan Agricultural Experiment Station, and the Beet Sugar Development Foundation announce the joint release of SR98 (PI #655951), a sugarbeet germplasm with smooth, low soil tare root and high levels of resistance to damping-off and crown and root rot caused by *Rhizoctonia solani* Kühn (AG2-2). Previous smooth-root releases have been highly susceptible to diseases caused by *R. solani*, and the SR98 has incorporated *Rhizoctonia* resistant germplasm released from the USDA-ARS Ft. Collins, CO and East Lansing, MI *Rhizoctonia* resistance breeding programs. SR98 was developed at the Sugarbeet and Bean Research Unit in East Lansing, Michigan by J.M. McGrath and L.E. Hanson. SR98 has shown moderate yield potential in agronomic trials, and has shown reasonable resistance to *Aphanomyces* blackleg and *Cercospora* leaf spot as is customary of traditional East Lansing ARS germplasm. SR98 is expected to be used as a pollinator for developing hybrids adapted to the Great Lakes growing region.

SR98 is diploid, self-sterile, multigerm, and biennial. SR98 was developed from a wide range of germplasm as part of a population enhancement effort to increase genetic diversity and foster recombination among advanced public sugarbeet breeding materials. In the case of SR98, the bulk (62.5%) of germplasm contributing to the release derives from *Rhizoctonia* resistant materials. These *Rhizoctonia* resistant materials include EL51 (35%, 14 mother roots) and a mix of Ft. Collins derivatives from released materials (27.5%, 11 mother roots). Specifically, the Ft. Collins releases were selected under conditions favoring *Rhizoctonia* disease development in the 2001 East Lansing *Rhizoctonia* nursery, and seed emanating from healthy roots we designated the 'FC mix' (02B095, EL-A013703) were intercrossed with the bulk of other germplasm contributing to SR98 in the 2002 East Lansing greenhouse. 02B095 is composed of seed generated from two mother roots of FC705/1, two roots of FC709, four roots of FC709-2, one root of FC712, and two roots of FC714-1. SR98 also included five other germplasm lines; 17.5% (seven mother roots) contributed by EL0204 and its progenitor 96RM14-01 contributing the smooth-root trait and rhizomania (Rz1) resistance, 12.5% (5 mother roots) traditional

smooth-root germplasms, previously unreleased, 96N7 and 95HS3, and 5% (two roots) of an advanced population of traditional East Lansing sugarbeet (e.g. SP6822) crossed with fodder beet (e.g. Mescan's Round and Ovana) initially constructed as a source population for the introgression of the smooth-root trait from such fodder types, and one extra root (2.5%) of FC712. Each of these mother roots was selected for low disease expression of crown and root rot symptoms in the 2001 East Lansing Rhizoctonia crown and root rot nursery. All plants were interpollinated, and seed was harvested by mother root accession and subsequently tested individually. 'FCmix' was tested in the 2007 and 2008 East Lansing Rhizoctonia seedling disease nurseries, and seed was harvested from mother roots selected in this nursery in 2007. This seed, designated 07B154 (EL-A023047), is SR98. Thus, SR98 is expected to be segregating for many characters, however a majority of individuals are expected to be resistant to seedling or crown and root rot diseases, or both. SR98 is being released at this time because of the high priority for seedling disease resistance identified as needed in the Great Lakes growing region and the current lack of available improved germplasm. In the 2007 seedling Rhizoctonia nursery in East Lansing, SR98 had a September stand count of 30.0 plants (std. dev = 0, n=2 plots), compared with the resistant EL51 (mean = 25.5, std. dev. = 5.3, n = 4) and a susceptible unrelated smooth-root breeding line SR IC-2 (mean = 2.0, std. dev. = 1.4, n = 2). In 2008, SR98 had a mean stand count in July of 25.7 plants (std. dev = 3.5, n= 7 plots), relative to the resistant EL51 (mean = 21.0, std. dev. = 5.2, n = 4) and the susceptible SP7322 (mean = 2.5, std. dev. = 0.6, n = 4). Pre-inoculation stand counts taken June 29, 2008 for these three germplasms was 36.6 plants per plot (std. dev. = 7.4) with no significant difference between germplasms at this stage. By July 27, 2008, SR98 retained 64% of initial stand (std. dev. = 11%), the resistant EL51 retained 54% of initial stand (std. dev. = 6%) and the susceptible SP6822 retained only 9% of initial stand (std. dev = 2%).

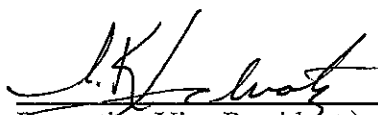
02B095 was also tested in a number of other disease nurseries in 2007 and 2008. In the 2007 Ft. Collins, CO Rhizoctonia crown and root rot nursery, SR98 had a Disease Index (DI; 0 = no disease, 7 = dead) of 1.7, relative to the highly resistant, resistant, and susceptible checks of 1.5, 2.8, and 3.5, respectively. And in the 2008 nursery, SR98 had a DI of 1.9, relative to highly resistant, resistant, and susceptible checks of 1.8, 1.8 and 3.1, respectively. In the 2007 Cercospora nursery in Saginaw, MI, SR98 had a final DI (0 = no disease, 9 = dead) of 3.3, relative to the highly resistant and susceptible checks of 1.7 and 5.3, respectively, and in 2008, SR98 had a DI of 3.7 (0 = no disease, 9 = dead) relative to the highly resistant and susceptible checks of 2.1 and 4.7, respectively. In 2008 only, SR98 was tested in the Betaseed, Inc. Aphanomyces nursery, with an average DI of 3.3 relative to the resistant and susceptible checks of 1.5 and 4.3, respectively. Also in 2008, SR98 was tested in the Betaseed, Inc. Fusarium nursery, with DI = 1.4 (0 = no disease, 9 = dead) compared to the resistant and susceptible checks of 2.1 and 6.9, respectively. SR98 has no appreciable resistance to rhizomania as tested in the 2008 Salinas, CA nursery.

Agronomic performance of SR98 has been reasonable in trials at the Saginaw Valley Bean and Beet Farm in Saginaw, MI. In 2007, root yield was 80.7% of the average of two commercial checks (29.7 Tons/Acre versus 36.9 T/A, respectively). Sucrose values were not obtained, however dry matter content was 93.7% of the same checks (19.9% versus 21.2%, respectively). In 2008, in the same location, 30-day emergence was 130.8% of eight commercial checks, yield was 85.3% of the same checks (19.6 T/A vs. 23.0 T/A), percent sucrose fresh weight was 90.7%

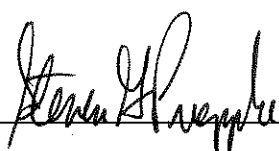
of checks (16.8 vs. 18.6%), and percent dry matter was 88.8% of checks (21.2% vs. 23.9%). Sucrose percent expressed as a fraction of dry matter was 101.9% of checks (79.4% vs. 77.9%; range of commercial values = 75.0 to 80.3).

SR98 is being released as a germplasm source for breeders to use in developing parental lines with resistance to Rhizoctonia damping-off, as well as combining smooth-rootedness with higher levels of Rhizoctonia crown and root rot resistance than is currently available in smooth-root material. SR98 appears to be useful as an additional source of Fusarium resistance. SR98 is an intermediate stage of development and is expected to segregate for these and other traits, and further selection to increase the frequency of Rhizoctonia resistance alleles in this population is planned. Limited quantities of seed will be available for use by writing to Dr. J. Mitchell McGrath, USDA-ARS, 494 PSSB, Michigan State University, East Lansing, MI 48824-1325. Efforts of Drs. L. Panella and R. Lewellen of the USDA-ARS, J. Miller and M. Rekoske of Betaseed, Inc., and T. Duckert, S. Shaw, T. Goodwill, and R. Naegelé at East Lansing in providing valuable disease nursery and agronomic testing assistance is gratefully acknowledged. Genetic material of this release has been deposited in the National Plant Germplasm System where it will be available for research purposes, including development and commercialization of new cultivars. It is requested that the author be notified if this germplasm contributes to the development of a new breeding line or cultivar.

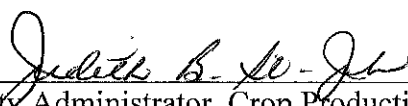
Signatures:

  
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